ISBN 0-7729-3555-6

MISSISSAUGA 1987

AIR QUALITY SURVEY
IN THE VICINITY OF
ANACHEMIA SOLVENTS LIMITED
Mavis Road, Mississauga
July 1987

JULY 1988

Ontario
Ministry of the Environment
Jim Bradley
Minister

ISBN 0-7729-3555-6

Mississauga 1987

Air Quality Survey in the vicinity of

Anachemia Solvents Limited Mavis Road, Mississauga

July 1987

ARB-194-87-AR/SP

Prepared for:

The Central Region
Ontario Ministry of the Environment

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April 1988

EXECUTIVE SUMMARY

At the request of the Central Region, Ministry of the Environment Mobile Air Monitoring Unit #1 performed an air quality survey in the vicinity of Anachemia Solvents Limited of Mississauga during July of 1987. The main aims of this survey were to: (1) perform monitoring during periods of odour; and (2) attempt to identify the compounds causing the odour(s) with special emphasis to be placed on the determination of ambient concentrations of aromatics and selected chlorinated organics (namely: toluene, ethylbenzene, xylenes, methylene chloride, methyl chloroform, trichloroethylene, and perchloroethylene).

From the acquired ambient air data, Anachemia Solvents Limited was deemed to be a source of a number of chlorinated organics (methylene chloride, methyl chloroform, and perchloroethylene) and aromatics (toluene, ethylbenzene, and xylenes). Significant concentrations of naphthalene were also detected but Anachemia was deemed not to be the source of this contaminant but rather the source(s) was determined to be west or north of this waste solvent recovery plant.

Some of the odours detected in this area could be attributed to the chlorinated compounds (ether and chloroform-like odours), aromatics (sweet, solvent-like odours) and naphthalene (coal-tar odours) measured in the air.

The ambient air was screened or sampled for approximately 145 different gaseous contaminants which included the compounds of interest. None of the applicable Ministry of the Environment Air Quality Standards, Criteria, Guidelines or Provisional Guidelines were exceeded.

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À la demande du bureau régional du Centre, l'unité mobile n° 1 de surveillance de l'air du ministère de l'Environnement a effectué, en juillet 1987, une étude de la qualité de l'air à proximité de l'usine Anachemia Solvents Limited, à Mississauga. Les principaux objectifs de cette étude étaient 1) d'analyser l'air lorsqu'il y a des odeurs et 2) d'essayer de déterminer quels composés dégagent ces odeurs; on a cherché plus particulièrement à déterminer les concentrations dans l'air ambiant des aromatiques et des produits organiques chlorés suivants : le phénylméthane, l'éthylbenzène, les xylènes, le chlorure de méthylène, le méthylchloroforme, le trichloréthylène et le tétrachloréthylène.

D'après les échantillons d'air recueillis, l'usine Anachemia Solvents Ltd. serait la source d'émanations d'un certain nombre de produits organiques chlorés (le chlorure de méthylène, le méthylchloroforme et le tétrachloréthylène) et d'aromatiques (le phénylméthane, l'éthylbenzène et les xylènes). On a également mesuré des concentrations notables de naphtalène, mais il semble que l'usine Anachemia ne soit pas la source de ce polluant. Il viendrait en effet de sources situées à l'ouest ou au nord de l'usine de récupération des solvants résiduaires.

Il est possible que certaines des odeurs détectées dans cette région proviennent des composés chlorés (des odeurs d'éther et des odeurs ressemblant à celle du chloroforme), des aromatiques (des odeurs sucrées et des odeurs ressemblant à celles des solvants) et du naphtalène (odeurs de goudron de houille) qui ont été mesurés dans l'air.

On a échantillonné environ 145 polluants gazeux, dont les composés mentionnés ci-dessus. Tous les critères, normes, lignes directrices et lignes directrices provisoires énoncés par le ministère de l'Environnement ont été respectés.

Abbreviations that will be used in this survey report:

CH_4	methane
CO	carbon monoxide
GC	gas chromatograph
km/hr	kilometres per hour
MAMU	Mobile Air Monitoring Unit
na.	not available
nd.	not detected
NO	nitric oxide
NO_x	oxides of nitrogen
NO_2	nitrogen dioxide
O_3	ozone
ppm	parts per million
SO_2	sulphur dioxide
THC	total hydrocarbon compounds
TH-M	non-methane hydrocarbons
ug/m^3	micrograms per cubic metre
VOC(s)	volatile organic compound(s)

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1.0 Background and Introduction

Anachemia Solvents Limited operates a waste solvent recovery plant at 3549 Mavis Road in Mississauga, Ontario (Figure 1). In recent years, a considerable amount of new industrial and residential development has taken place in the immediate area. With the increase in population, concern has been raised regarding fugitive gaseous emissions from this recovery plant. In particular, since the plant deals with the reclamation of methylene chloride, trichloroethylene and perchloroethylene, the ether-like and chloroform-like odours of these compounds are the potential reasons for the numerous odour complaints which have been registered with the Ministry. Not only is the public concerned about the odours but they are also concerned about possible health effects of these compounds and any other gaseous compounds (especially chlorinated organics) that may be emitted from this plant.

Due to these complaints and pending additional residential development in the area, the Central Region of the Ministry requested the Air Resources Branch to conduct an air quality survey in the vicinity of this recovery plant. The main objectives of this survey were to: (1) perform monitoring during periods of odour; and (2) attempt to identify the compounds causing the odour(s) with special emphasis placed on the determination of the ambient concentration levels of aromatics and the aforementioned chlorinated organics.

2.0 The Monitoring Programme

The mobile air monitoring unit used in this survey (MAMU#1) contained a variety of analyzers that enabled screening of the ambient air for 138 different volatile organic compounds (VOCs) and 10 different (mainly inorganic) contaminants (SO_2, NO_x, NO, NO_2, THC, TH-M, CH_4, TRS, O_3 and CO).

The most versatile analyzer of MAMU#1 was the dual capillary column gas chromatographic system which was used for the detection, identification and quantification of VOCs. To detect individual VOCs at the 1 ug/m^3 concentration level, ambient air was drawn through a trace organic preconcentrator unit for a set period of time - usually for a half-hour or a one-hour duration. In the preconcentrator, the organics were adsorbed onto a Carbotrap-Spherocarb cartridge and then thermally desorbed and prefocused onto a nickel loop cooled to -195°C with liquid nitrogen. The prefocused organics were then flash vapourized and injected simultaneously onto the heads of two 25 metre capillary columns (OV-1 and SE-54) where the individual organics were separated. The eluted organics were then detected by flame ionization detectors. Positive identification of the eluted volatile organic compounds was assisted by a computer which compared and correlated the results with a library of retention indices which were established from prior calibration tests.

MAMU#1 also housed a complete ground-based meteorological station which continuously recorded wind direction and speed, ambient temperature, humidity, solar radiation and barometric pressure data.

A more detailed description of the specific monitoring capabilities of MAMU#1 is listed in Table 1 and the respective detection limits for the gaseous contaminants together with the applicable Ministry of the Environment Standards, Criteria, Guidelines and Provisional Guidelines are presented in Table 2.

The daily monitoring programme consisted of performing calibration checks on all analyzers during the early morning; acquiring downwind air quality data with respect to Anachemia whenever feasible and then acquiring upwind data. Samples were collected for VOC analysis only when the instrument operator felt that the monitoring unit was downwind of Anachemia. At other times (overnight or when the unit could not be positioned downwind), no VOC sampling was carried out.

As presented in Table 3, monitoring was conducted on July 21, 22, 23, 28 and 29. During this time, a large data set was

collected for the above-mentioned contaminants, including 14 VOC samples (6 upwind and 8 downwind).

Anachemia Solvents Limited receives waste solvents and cleans them (primarily by distillation) for reuse. Because of the nature of this business, inadequate or improper solvent handling procedures may result in many common industrial solvents being emitted for significant periods of time to the ambient air. Ministry staff of the Central Region indicated that this may be the major source of the odour complaints. For this reason, screening of the ambient air for fugitive emissions adjacent to the plant property was also undertaken by the monitoring unit.

The number of suitable monitoring sites in the immediate vicinity of Anachemia is limited. There are several established industries adjacent to Anachemia; a major traffic route (Mavis Road) directly in front of the plant; and a large, impassible field behind (Figure 1). Permission was obtained from Anachemia's two neighbours to park the monitoring unit in their 'backyards'. Ultramar (north of Anachemia; a combination refueling station for large trucks and a large scale metal working operation) and Courtesy Disposal (south of Anachemia; maintainers and removers of large dumpsters) allowed the Ministry complete access to all parts of their property. Courtesy Disposal was not directly adjacent to Anachemia but rather, the second property south of this plant. The property adjacent to and south of Anachemia was Nido's autobody shop. Its backyard was relatively clean but very uneven, thus the monitoring unit could not travel in the area. The overnight monitoring site was in the parking area of Bell Canada, a site almost directly across the street (due west) from Anachemia. It should be noted that the operations at Anachemia are carried on around the clock.

Since monitoring of specific chlorinated volatile organic compounds was requested, a description of their characteristics is presented.

Methylene chloride, properly named dichloromethane (CH_2Cl_2), is a colourless, non-flammable, volatile liquid with a penetrating ether-like odour. This solvent may be used as a paint remover, a fumigant, a degreaser, or a propellant for aerosols. The Ministry Air Quality Standard for this chlorinated organic is based on odour and is 100,000 ug/m^3 for an allowable maximum half-hour average ground level concentration.

Methyl chloroform, properly named 1,1,1-trichloroethane (CH_3CCl_3), is a nonflammable, colorless solvent used for cleaning of precision equipment; as an aerosol propellant; as a metal degreaser; and as a pesticide. The Ministry Air Quality Standard for this chlorinated organic is based on health effects and is 350,000 ug/m^3 for an allowable maximum half-hour average ground level concentration.

Trichloroethylene, properly named trichloroethene (C_2HCl_3), is a stable, colorless, heavy liquid with a chloroform-like odour. Some uses for this solvent are: metal degreasing, extraction solvent for oils, fumigant, medicine (anaesthetic), and cleaning. Its Ministry Air Quality Standard is based on health effects and is 85,000 ug/m^3 for an allowable maximum half-hour ground level concentration.

Perchloroethylene, properly named tetrachloroethene (C_2Cl_4), is a stable, colorless liquid with an ether-like odour. Some of its uses are: dry cleaning solvent, vapour degreasing solvent, and in the manufacture of fluorocarbons. Its Ministry Air Quality Standard is also based on health effects and is 10,000 ug/m^3 for an allowable maximum half-hour average ground level concentration.

It should be noted that many organic solvents are too polar to be detected and quantified by the present GC system. It should also be noted that different chemical compounds have different odour thresholds and that they may be detected by humans before being detected by the instruments of the monitoring unit.

3.0 Discussion of Results

Tuesday, July 21

The centre of a low pressure area was located over Niagara Falls. Scattered cumulus and moderate (15 to 20 km/hr) northwesterly winds were present in Mississauga. The temperature was in the high twenties (°C) and by mid-afternoon, the air mass had become dry and stable.

Because of the winds, only upwind monitoring could be carried out on this date. MAMU #1 arrived in the area around 10:00 hrs and was immediately placed on shoreline power at the Bell Canada site (site K as shown in Figure 1). After calibrations, a survey was started with 3.5 hours of common contaminant data and 2 one-hour VOC samples being collected (period A212; Table 3). The maximum one-hour average ground level concentrations of CO, THC, NO_2, and O_3 were 0.5, 1.8, 0.01, and 0.04 ppm respectively (Table 4). From the GC analysis of the two VOC samples, the total organic concentrations were 501 and 99 ug/m^3 (Table 5). Because of the hot ambient temperature, some evaporative emissions (fuel and greases) from the monitoring unit were sampled during the first sample (the alkane concentration was 437 ug/m^3). It is felt that the second sample was more indicative of the general air quality in this area (the alkane concentration had dropped to 59 ug/m^3). The total aromatic concentrations were similar in both samples (56 and 38 ug/m^3) and as for the four 'targetted' chlorinated organics, only 4 ug/m^3 of tetrachloroethene were detected (first sample). Butane, at a concentration of 369 ug/m^3, was the most dominant organic detected in these two samples.

The results for the 17.5 hours staring at 14:43 hrs are shown in Table 4 (period A213). The maximum one-hour average ground level concentrations of CO, THC, NO_2 and O_3 were 0.8, 2.2, 0.05 and 0.04 ppm respectively. The meteorological measurements indicated a weak nocturnal inversion overnight - high relative humidity and calm or light northwesterly winds.

Wednesday, July 22

A high pressure area dominated southern Ontario. The air mass was dry and stable in Mississauga and it was a clear, hot, humid day with very light northwesterly winds.

After the morning calibrations, MAMU #1 moved to the 'backyard' of Courtesy Disposal Limited (site H in Figure 1) and since this area was downwind of Anachemia Limited, a survey was

started. Commencing at 10:07 hrs, two half-hour VOC samples and almost 3 hours of common contaminant data were acquired (period A222; Table 3). Some odour was present and as can be seen from Table 4, relatively high ground level concentrations of total hydrocarbon compounds (THC) were recorded. When the wind was from the northwest, a maximum one-hour average ground level concentration of 7 ppm for THC was recorded. However, the maximum one-hour average ground level concentrations of the other common contaminants were relatively lower at 1.1 ppm for CO; 0.03 ppm for NO_2; and 0.07 ppm for O_3. Gas chromatographic analysis of the two samples revealed significant concentrations of VOCs. The total organic concentrations were 693 and 414 ug/m^3. On the average, the alkanes, aromatics, chlorinated alkanes and chlorinated alkenes comprised 29% (159 ug/m^3), 48% (268 ug/m^3), 17% (92 ug/m^3), and 4% (24 ug/m^3) of these totals respectively. Of the targetted chlorinated compounds; 123 and 32 ug/m^3 of dichloromethane, 7 and 4 ug/m^3 of 1,1,1-trichloroethane, and 35 and 13 ug/m^3 of tetrachloroethene were detected. Trichloroethene was not detected in these samples (nor was it detected in any of the other VOC samples acquired throughout this entire survey). Apart from the aforementioned chlorinated alkanes, the other dominant organics were toluene (165 and 80 ug/m^3), xylenes (113 and 47 ug/m^3), and naphthalene (16 and 29 ug/m^3). As can be seen in Table 2, only the concentrations of naphthalene approached its applicable Ministry Air Quality Provisional Guideline (36 ug/m^3 for an allowable maximum half-hour average concentration).

At 14:00 hrs, MAMU #1 was moved to the 'backyard' of Ultramar (site E in Figure 1), upwind of Anachemia Solvents Limited (see period A223; Table 3). The ambient temperature was 33°C, the winds remained northwesterly and some odour was discernable by the Ministry staff. During the monitoring, heavy machinery (including several propane-powered forklifts) was in operation throughout the small industrial complex north of Ultramar (site C in Figure 1). Elevated ground level concentrations of CO and THC were measured (Table 4). The maximum one-hour average ground level concentrations of CO, THC, NO_2, and O_3 were 2.2, 4.3, 0.03, and 0.06 ppm respectively. From the analysis of the VOC sample, the total organic concentration was determined to be 184 ug/m^3 with essentially equal contributions from the alkane (98 ug/m^3) and aromatic (83 ug/m^3) fractions (Table 5). No chlorinated organics were detected in this sample and as for naphthalene, its concentration was similar to that reported for the two downwind VOC samples (22 versus 16 and 29 ug/m^3 respectively).

These results suggest that Anachemia Solvents Limited was a source of some chlorinated organics (dichloromethane, 1,1,1-trichloroethane and tetrachloroethene) and some aromatics (toluene and xylenes) but <u>not</u> a source of naphthalene. The data also suggests that the source(s) of naphthalene lay to the north or northwest of Anachemia.

At 15:45 hrs, MAMU #1 returned to its overnight site at Bell Canada and a monitoring programme was started. Commencing at 15:51 hrs, 16.5 hours of common contaminant data were acquired (period A224; Table 3). This site was upwind of Anachemia and no VOC samples were acquired. Again the winds were calm overnight and a weak nocturnal inversion was present. The maximum one-hour average ground level concentrations of CO, THC, NO_2 and O_3 were 2.4, 4.1, 0.11, and 0.04 ppm respectively (Table 4). These concentrations were somewhat elevated as the applicable Ministry Air Quality Criteria are: 30 ppm for CO; (the Ministry has no Air Quality Criterion for THC); 0.20 ppm for NO_2; and 0.08 ppm for O_3.

Thursday, July 23

It was a hot, hazy and humid day. The high pressure area had slowly moved eastward and the air mass was dry and stable over Mississauga. The ambient temperature was in the mid-thirties and the winds were generally moderate and westnorthwesterly.

After the morning calibrations, an upwind survey was commenced at 09:52 hrs in the rear parking lot of Ultramar Limited (period A232; Table 3 and site E in Figure 1). Elevated concentrations were measured for CO and THC. The maximum one-hour average ground level concentrations of these two contaminants were 1.5 and 3.3 ppm respectively (Table 4). From the GC analysis of the VOC sample, 52 different organics were detected and the total organic concentration was determined to be 288 ug/m^3 with the alkane and aromatic fractions accounting for 64% (185 ug/m^3) and 31% (88 ug/m^3) of this total respectively. The more dominant organics were the low-boiling alkanes (for example: propane at 71 ug/m^3, butane at 25 ug/m^3, 2-methylbutane at 19 ug/m^3), aromatics (toluene at 22 ug/m^3 and xylenes at 15 ug/m^3) and naphthalene at 20 ug/m^3. Of the targetted chlorinated organics, only a small concentration of tetrachloroethene was detected (9 ug/m^3).

Due to a gradual wind shift, by 11:00 hrs, it was very difficult to get downwind of Anachemia. Under westerly winds, MAMU #1 had to be moved to the far northeast corner of Courtesy Disposals' property (site H in Figure 1) and even at this site, only monitoring of the gaseous emissions from the front half of Anachemia was possible. Starting at 11:45 hrs, 3.4 hours of common contaminant data and one half-hour VOC sample were acquired (period A233; Table 3). Significant concentrations of the common contaminants were measured during this period as the maximum one-hour average ground level concentrations of CO, THC, NO_2, and O_3 were 1.8, 5.8, 0.04, and 0.09 ppm respectively. The applicable Environmental Air Quality Criteria for CO, NO_2, and O_3 are 30, 0.20, and 0.08 ppm respectively. Thus the Air Quality Criterion for O_3 was exceeded during this period. From the GC analysis of the VOC sample, 43 different organics were detected and the total organic concentration was determined to be 402 ug/m^3 (Table 5). The

alkanes, aromatics, and chlorinated alkanes comprised 30% (120 ug/m^3), 48% (191 ug/m^3), and 21% (83 ug/m^3) of this total respectively. For the targetted chlorinated organics; 76 ug/m^3 of dichloromethane, 7 ug/m^3 of 1,1,1-trichloroethane, and 2 ug/m^3 of tetrachloroethene were detected. The other major organics detected in this sample were the aromatics (toluene and xylenes at 87 and 71 ug/m^3) and naphthalene at 17 ug/m^3.

After 16:00 hrs, MAMU #1 was moved back to the overnight monitoring site at Bell Canada and at 17:11 hrs, the monitoring of the common contaminants commenced (period A234; Table 3). From the 17 hours of acquired data, the overall average ground level concentrations had decreased slightly (Table 4). The maximum one-hour average ground level concentrations of CO, THC, NO_2, and O_3 were 1.9, 3.7, 0.08, and 0.07 ppm respectively.

From these results, three of the targetted chlorinated organics (albeit detected in low concentrations) appeared to have originated from Anachemia. Significant concentrations of naphthalene were measured both downwind (17 ug/m^3) and upwind (20 ug/m^3) of Anachemia. Since the winds were westerly or northwesterly, this data suggested that the naphthalene source(s) had to be west or northwest of Anachemia. Significant concentrations of the common contaminants were also measured and the Ministry Air Quality Criterion for O_3 was exceeded during the afternoon monitoring. (Later in the afternoon, the upwind maximum one-hour average ground level concentration of O_3 was found to be 0.07 ppm. But when one considers the elevated upwind concentrations and the other data acquired during this day, no specific source(s) of ozone could be ascertained.)

Tuesday, July 28

A high pressure area dominated the weather over southern and central Ontario on this date. The air mass was dry and stable and it was a clear, hot, humid day in Mississauga. The winds were very light and southeasterly.

Because of the light winds, it was very difficult to find a downwind monitoring site with respect to Anachemia. Finally, the winds became more constant and a downwind site was found at the rear of Ultramar Limited. This location was adjacent to Anachemia and monitoring started at 10:02 hrs (period A282; Table 3). Significant concentrations were measured for CO, THC and NO_2 (Table 4) but as the staff noted, this may have been due to an increase in vehicular traffic at the Anachemia plant. Nevertheless, the maximum one-hour average ground level concentrations of CO, THC, and NO_2 were determined to be 3.9, 7.3, and 0.05 ppm respectively. The overall average ground level concentrations of these contaminants were only slightly lower at 2.6, 4.4, and 0.04 respectively. For the 3 VOC samples, an average of 47 different organics were detected and the

total concentrations were 404, 1064, and 729 ug/m^3 (Table 5). On the average, the alkanes, aromatics and the chlorinated alkanes comprised 25% (183 ug/m^3), 38% (275 ug/m^3), and 35% (258 ug/m^3) of these totals respectively. The more dominant organics were the targetted chlorinated compounds (dichloromethane at 96, 420 and 115 ug/m^3; 1,1,1-trichloroethane at 40, 64 and 39 ug/m^3; and tetrachloroethene at 23, not detected, and 11 ug/m^3) and the aromatics (toluene at 91, 240, and 66 ug/m^3; ethylbenzene at 16, 57 and 16 ug/m^3; and xylenes at 52, 177, and 72 ug/m^3). Apart from butane (one concentration value of 237 ug/m^3 being detected), low concentrations (less than 20 ug/m^3) were found for the individual alkanes. Naphthalene was detected in only one of the three samples and its concentration was only 2 ug/m^3.

At 14:00 hrs, MAMU #1 moved to the rear of Lakeside Contracting Limited (site I in Figure 1), upwind of Anachemia. At 14:18 hrs, monitoring commenced (period A283; Table 3). Slightly lower concentrations of common contaminants were measured at this site as the maximum one-hour average ground level concentrations of CO, THC, and O_3 were 0.9, 2.9, and 0.04 ppm respectively (Table 4). From the VOC sample, only 15 different organics were detected and the total organic concentration was only 22 ug/m^3 (Table 5). None of the targetted chlorinated organics were present however, naphthalene was detected at a concentration of 2 ug/m^3.

These results show that Anachemia appears to be a source of chlorinated organics and some aromatics but none of the concentrations were in excess of the applicable Ministry Air Quality Criteria, Guidelines or Provisional Guidelines.

At 15:30 hrs, MAMU #1 moved back to the overnight monitoring site at Bell Canada. Starting at 15:50 hrs, just over 16 hours of common contaminant data were acquired (period A284; Table 3). The winds had remained light and southeasterly until 20:00 hrs. Around midnight, the winds were northerly at 10 to 15 km/hr. The concentrations of the common contaminants were lower but still remained elevated as the maximum one-hour average ground level concentrations of CO, THC and NO_2 were 2.4, 3.1 and 0.06 ppm respectively.

Wednesday, July 29

The high pressure area had moved eastward and now was located over Ottawa. The air mass in southern and central Ontario remained dry and stable. During the morning, the winds were light and variable but by noon, they had become southeasterly at 10 to 15 km/hr. It was sunny and very hot (temperatures in the mid to high twenties).

After the morning calibrations, MAMU #1 moved to the rear

lot of Courtesy Disposal Limited and started to acquired some upwind data. Monitoring commenced at 10:33 hrs (period A292; Table 3). Reasonably low concentrations of the common contaminants were recorded as the maximum one-hour average ground level concentrations of CO, THC, NO_2 and O_3 were 0.8, 1.8, 0.03 and 0.04 ppm respectively (Table 4). With respect to the VOCs, only 6 different organics (all alkanes) were detected for a total concentration of only 20 ug/m^3 (Table 5).

At 12:30 hrs, MAMU #1 moved to the rear lot of Ultramar Limited. The winds had remained light and southeasterly and this site was downwind of Anachemia Solvents Limited. Starting at 12:43 hrs, 2.3 hours of common contaminant data and 2 half-hour VOC samples were acquired (period A293; Table 3). During the acquisition of this data, very high concentrations of THC were measured. At approximately 13:00 hrs, the one-minute average ground level concentration of the non-methane component of THC reached 45 ppm. Significant concentrations of the other contaminants were measured as the maximum one-hour average ground level concentrations of CO, THC, NO_2, and O_3 were 1.8, 15.7, 0.04, and 0.06 ppm respectively. From the GC analysis, high concentrations of VOCs were also detected (Table 5). Approximately 50 different VOCs were detected and the total organic concentrations were 3101 and 2416 ug/m^3. On the average, the alkanes, aromatics, and the chlorinated alkanes comprised 26% (716 ug/m^3), 66% (1831 ug/m^3), and 6% (173 ug/m^3) of these totals respectively. The more dominant VOCs were the alkanes (propane at 224 and 2 ug/m^3, 4-methyloctane at 258 and 244 ug/m^3, and 2-methyloctane at 258 and 244 ug/m^3), the aromatics (benzene at 4 and 66 ug/m^3, toluene at 855 and 583 ug/m^3, ethylbenzene at 222 and 210 ug/m^3, and the xylenes at 839 and 836 ug/m^3), and chlorinated organics (dichloromethane at 260 and 57 ug/m^3, and 1,1,1-trichloroethane at 22 and 2 ug/m^3). Very low concentrations (2 ug/m^3) of naphthalene were detected in these 2 samples.

As with the other monitoring, these results suggest that Anachemia Solvents Limited was a source of some aromatics and chlorinated organics, but the concentrations were all below the applicable Ministry Air Quality Criteria, Guidelines and Provisional Guidelines.

After 15:00 hrs, MAMU #1 moved back to the Bell Canada overnight site and monitoring commenced at 15:25 hrs (period A294; Table 3). The winds were generally southeasterly backing to the north as the morning approached. Some elevated concentrations were measured as the maximum one-hour average ground level concentrations of CO, THC, NO_2 and O_3 were 3.4, 5.1, 0.09, and 0.05 ppm respectively. But these results were probably due to vehicular emissions during the morning rush-hour along Burnhamthorpe and Mavis Roads.

4.0 Summary

At the request of the Central Region, Mobile Air Monitoring Unit #1 performed an air quality survey in the vicinity of Anachemia Solvents Limited of Mississauga during July of 1987. The main aims of this survey were to: (1) perform monitoring during periods of odour; and (2) attempt to identify the compounds causing the odour(s) with special emphasis placed on the determination of the ambient concentration levels of selected chlorinated organics (dichloromethane, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene).

This survey was conducted on July 21, 22, 23, 28, and 29 and during this time, air quality data was acquired during 14 different periods. Apart from the overnight monitoring, 14 volatile organic samples and 20 hours of common contaminant data were acquired in the vicinity of Anachemia Solvents Limited. The volatile organic contaminant data are summarized in the table below.

Air Quality Data Summary

VOCs - concentrations in ug/m^3

	Downwind		Upwind	
	Average	Maximum	Average	Maximum
Propane	47	224	17	71
Butane	45	237	72	369
Pentane	12	18	8	15
Dichloromethane	147	420	nd.	nd.
Hexane	8	10	4	7
1,1,1-Trichloroethane	23	64	nd.	nd.
Benzene	12	66	3	8
Trichloroethene	nd.	nd.	nd.	nd.
Toluene	271	855	16	41
Tetrachloroethene	11	35	2	9
Ethylbenzene	71	222	2	5
Xylenes	276	849	11	28
Naphthalene	8	29	7	22
Total Organic Conc.	1153	3101	186	501
Chlorinated Alkanes	173	484	1	2
Alkanes	302	842	135	437
Aromatics	652	1941	46	88

These data suggest that Anachemia Solvents Limited was a source of some chlorinated organics (namely: dichloromethane, 1,1,1-trichloroethane, and tetrachloroethene), some aromatics (namely: toluene, ethylbenzene, and xylenes), and total hydrocarbon compounds in general. Significant concentrations of naphthalene were detected during this survey but Anachemia was not the source of this contaminant. (The data suggested that the source(s) of naphthalene lay to the west or north of Anachemia.)

Some of the odours in this area may be attributed to the aforementioned chlorinated compounds (ether and chloroform-like odours), aromatics (sweet, solvent-like odours) and naphthalene (coal-tar odours).

The ambient air was screened or sampled for approximately 145 different gaseous contaminants which included the compounds of interest. None of the applicable Ministry of the Environment Air Quality Standards, Criteria, Guidelines or Provisional Guidelines were exceeded.

APPENDIX ..... The Data

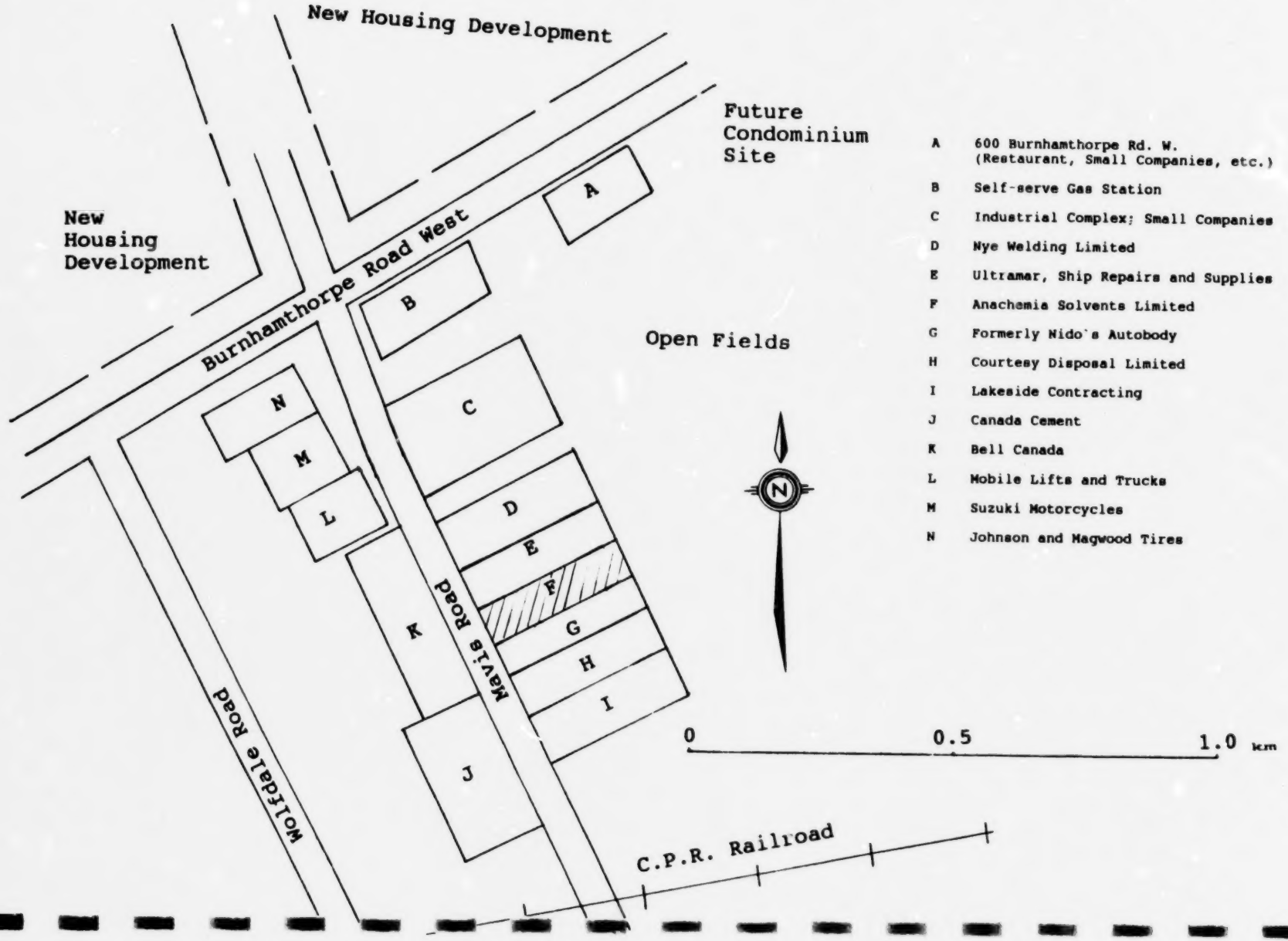

Figure 1
General Area Map

Table 1

THE INSTRUMENTATION OF MOBILE AIR MONITORING UNIT #1

Instrument	Manufacturer	Analytical Technique	Full Scale Sensitivity
THC, CH4, TH-M analyzer	Ingenieur-Produktions-Gruppe Munchen (IPM) RS-t	Dual flame ionization	50 ppm THC (as CH4)
H2S,SO2,NOx sources	Hartmann & Braun Prufgasgenerator	N/A	N/A
TRS/SO2 analyzer	Monitor Labs 8850 c/w ML 8770	Fluorescence	0.5 ppm SO2 0.5 ppm TRS
NOx, NO2, NO analyzer	Monitor Labs 8840	Chemi-Luminescence	1.0 ppm NOx (as NO2)
CO analyzer	Thermo Electron P48	Gas Filter Correlation	100 ppm CO (digital)
O3 analyzer/ source	Dasibi 1003-AAS	UV Absorption	1.0 ppm O3 (digital)
Hewlett Packard Data Acquisition System - HP 85 and HP 3497A			
Gas Chromatograph	HP 5880 Dual Capillary Column c/w HP 86 Data Acquisition System	Flame Ion-ization Det.	as set per calibrations

Meteorological Instrumentation

** Wind speed	Lambrecht GmBH	km/hr
** Wind direction	Lambrecht GmBH	degrees
Temperature	Weather Measure (WM) T621	degrees Celsius
Humidity	WM-HM-11P	absolute & %
Barometric pressure	WM-BM70-B242	millibars
Solar Radiation	WM Star Pyranometer	milliwatts/cm2

** These instruments are located on top of a 10 metre retractable tower

Table 2

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m^3 (micrograms per cubic metre) Updated October 16, 1987

		Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
1	PROPANE	0.2					
2	PROPADIENE	0.3					ALLENE
3	PROPYNE	0.3					METHYL ACETYLENE
4	CYCLOPROPANE	0.3					
5	2-METHYLPROPANE	0.3					ISOBUTANE
6	CHLOROETHENE	0.3	560 (2)	280 (A)	5000	10000	VINYL CHLORIDE; CHLOROETHYLENE
7	1-BUTENE	0.3					
8	1,3-BUTADIENE	0.3					
9	BUTANE	0.2			1900000		*n-BUTANE*
10	1-BUTYNE	0.3					ETHYLACETYLENE
11	CHLOROETHANE	0.3			2600000	3250000	ETHYL CHLORIDE
12	3-METHYL-1-BUTENE	0.3					ISOAMYLENE
13	2-METHYLBUTANE	0.3					ISOPENTANE
14	2-METHYL-1-BUTENE	0.3					
15	PENTANE	0.2			1800000	2250000	*N-PENTANE*
16	2-METHYL-1,3-BUTADIENE	0.4					ISOPRENE
17	trans-2-PENTENE	0.2					
18	cis-2-PENTENE	0.2					
19	DICHLOROMETHANE	1.5	100000 (1)	100000 (B)	350000	1740000	METHYLENE CHLORIDE
20	2-METHYL-2-BUTENE	0.3					
21	2,2-DIMETHYLBUTANE	0.2					NEOHEXANE

Table 2 ctd.

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m³ (micrograms per cubic metre) Updated October 16, 1987

		Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
22	trans-1,2-DICHLOROETHENE	0.3					
23	3-METHYL-1-PENTENE	0.2					
24	4-METHYL-1-PENTENE	0.2					
25	CYCLOPENTANE	0.2					
26	2,3-DIMETHYLBUTANE	0.2					
27	2-METHYLPENTANE	0.2					
28	3-METHYLPENTANE	0.2					
29	1-HEXENE	0.3					
30	cis-1,2-DICHLOROETHENE	0.3			790000	1000000	cis-1,2-DICHLOROETHYLENE; SYM-DICHLOROETHYLENE
31	2-CHLOROBUTANE	0.6					sec-BUTYL CHLORIDE
32	1-CHLORO-2-METHYLPROPANE	0.4					
33	HEXANE	0.3	35000 (2)	12000 (A)	180000		*n-HEXANE*
34	TRICHLOROMETHANE	2.2	1500 (2)	500 (A)	50000	225000	CHLOROFORM
35	trans-3-HEXENE	0.3					
36	3-CHLORO-2-METHYLPROPENE	0.3					ISOBUTENYL CHLORIDE
37	METHYLCYCLOPENTANE	0.2					
38	2,4-DIMETHYLPENTANE	0.2					
39	1,2-DICHLOROETHANE	0.2			40000	60000	ETHYLENE CHLORIDE
40	2,2-DIMETHYLPENTANE	0.4					
41	2,2,3-TRIMETHYLBUTANE	0.2					
42	1,1,1-TRICHLOROETHANE	1.0	350000 (1)	115000 (A)	19000000	2450000	METHYL CHLOROFORM

Table 2 ctd.

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m^3 (micrograms per cubic metre) Updated October 16, 1987

		Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
43	1-CHLOROBUTANE	0.4					n-BUTYL CHLORIDE
44	BENZENE	0.2	10000 (1)	3300 (A)	30000	75000	
45	TETRACHLOROMETHANE	0.9	1800 (2)	600 (A)	20000	125000	CARBON TETRACHLORIDE
46	3,3-DIMETHYLPENTANE	0.2					
47	CYCLOHEXANE	0.2	300000 (2)	100000 (A)	1050000	1300000	HEXAHYDROBENZENE
48	2,3-DIMETHYLPENTANE	0.3					
49	2-METHYLHEXANE	0.5					ISOHEPTANE
50	CYCLOHEXENE	0.3			1015000		
51	DIBROMOMETHANE	18.4					METHYLENE DIBROMIDE; METHYLENE BROMIDE
52	1,2-DICHLOROPROPANE	0.6					PROPYLENE CHLORIDE
53	3-METHYLHEXANE	0.5					
54	2,3-DICHLOROPROPENE	0.7			5000	50000	2,3-DICHLOROPROPYLENE
55	TRICHLOROETHENE	0.3	85000 (1)	28000 (A)	270000	1080000	TRICHLOROETHYLENE
56	2,2,4-TRIMETHYLPENTANE	0.2					ISOOCTANE
57	1-HEPTENE	0.3					
58	HEPTANE	0.2			1600000	2000000	*n-HEPTANE*
59	trans-2-HEPTENE	0.3					
60	METHYLCYCLOHEXANE	0.2			1600000	2000000	HEXAHYDROTOLUENE
61	2,2-DIMETHYLHEXANE	0.2					
62	ETHYLCYCLOPENTANE	0.2					
63	4-METHYLCYCLOHEXENE	0.3					

Table 2 ctd.

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m³ (micrograms per cubic metre) Updated October 16, 1987

	Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
64 2,5-DIMETHYLHEXANE	0.5					
65 1-CHLOROPENTANE	0.4					n-AMYL CHLORIDE; PENTYL CHLORIDE
66 1,1,2-TRICHLOROETHANE	1.1					VINYL TRICHLORIDE
67 2,3,4-TRIMETHYLPENTANE	0.2					
68 TOLUENE	0.2	2000 (1)	2000 (A)	375000	560000	*METHYLBENZENE*; PHENYLMETHANE
69 1,3-DICHLOROPROPANE	0.7			350000	510000	TRIMETHYLENE CHLORIDE
70 2-METHYLHEPTANE	0.2					
71 4-METHYLHEPTANE	0.2					
72 c-1,3-DIMETHYLCYCLOHEXANE	0.2					
73 3-METHYLHEPTANE	0.2					
74 1,2-DIBROMOETHANE	2.1					ETHYLENE DIBROMIDE; ETHYLENE BROMIDE
75 1,1-DIMETHYLCYCLOHEXANE	0.3					
76 1-OCTENE	0.4	150000 (3)	50000 (A)			
77 trans12DIMETHYLCYCLOHEXANE	0.3					*trans-1,2-DIMETHYLCYCLOHEXANE
78 trans-4-OCTENE	0.3					
79 TETRACHLOROETHENE	0.9	10000 (2)	4000 (A)	335000	1340000	TETRACHLOROETHYLENE; PERCHLOROETHYLENE
80 c-1,4-DIMETHYLCYCLOHEXANE	0.3					
81 OCTANE	0.3	45400 (3)	15300 (A)	1450000	1800000	*n-OCTANE*
82 trans-2-OCTENE	0.6					
83 cis12DIMETHYLCYCLOHEXANE	0.2					
84 CHLOROBENZENE	0.4			350000		PHENYL CHLORIDE

Table 2 ctd.

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m³ (micrograms per cubic metre) Updated October 16, 1987

		Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
85	ETHYLCYCLOHEXANE	0.1					
86	1-CHLOROHEXANE	0.5					n-HEXYL CHLORIDE
87	ETHYLBENZENE	0.3	4000 (1)	4000 (B)	435000	545000	
88	m&p-XYLENES	0.3	2300 (4)	2300 (A)	435000	655000	*1,3-DIMETHYLBENZENE*
89	4-METHYLOCTANE	0.3					
90	2-METHYLOCTANE	0.3					
91	3-METHYLOCTANE	0.3					
92	STYRENE	0.5	400 (1)	400 (A)	215000	425000	*ETHENYLBENZENE*; PHENYLETHYLENE; VINYLBENZENE
93	1,4-DICHLOROBUTANE	0.3					
94	o-XYLENE	0.3	2300 (4)	2300 (A)	435000	655000	*1,2-DIMETHYLBENZENE*
95	1,1,2,2-TETRACHLOROETHANE	2.6					ACETYLENE TETRACHLORIDE
96	1,2,3-TRICHLOROPROPANE	1.3			300000	450000	TRICHLOROHYDRIN
97	1-NONENE	0.7					
98	trans-1,4-DICL-2-BUTENE	0.9					
99	NONANE	0.3			1050000	1300000	*n-NONANE*
100	ISOPROPYLBENZENE	0.3	100 (3)	100 (B)			*(1-METHYLETHYL)BENZENE*; CUMENE
101	2-CHLOROTOLUENE	0.3					*2-CHLORO-1-METHYLBENZENE*; o-TOLYL CHLORIDE; o-CHLOROTOLUENE
102	3-CHLOROTOLUENE	0.5					*3-CHLORO-1-METHYLBENZENE*; m-TOLYL CHLORIDE; m-CHLOROTOLUENE
103	4-CHLOROTOLUENE	0.5					*4-CHLORO-1-METHYLBENZENE; p-TOLYL CHLORIDE; p-CHLOROTOLUENE
104	PROPYLBENZENE	0.4					n-PROPYLBENZENE
105	3-ETHYLTOLUENE	0.3					*1-ETHYL-3-METHYLBENZENE*; M-ETHYLTOLUENE

Table 2 ctd.

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m³ (micrograms per cubic metre) Updated October 16, 1987

	Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
106 4-ETHYLTOLUENE	0.3					*1-ETHYL-4-METHYLBENZENE*; P-ETHYLTOLUENE
107 1,3,5-TRIMETHYLBENZENE	0.4			125000	170000	MESITYLENE
108 2-ETHYLTOLUENE	0.3					*1-ETHYL-2-METHYLBENZENE*; O-ETHYLTOLUENE
109 1,2,4-TRIMETHYLBENZENE	0.4	100 (2)	1000 (A)	125000	170000	PSUEDOCUMENE
110 tert.BUTYLBENZENE	0.3					*(1,1-DIMETHYLETHYL)BENZENE*
111 tert.BUTYLCYCLOHEXANE	0.4					
112 1,3-DICHLOROBENZENE	0.8					
113 1-DECENE	1.3	180000 (3)	60000 (A)			n-DECYLENE
114 (CHLOROMETHYL)BENZENE	4.3					alpha-CHLOROTOLUENE; BENZYL CHLORIDE
115 1,5-DICHLOROPENTANE	0.3					
116 isoBUTYLBENZENE	0.3					
117 DECANE	0.5					*n-DECANE*
118 sec.BUTYLBENZENE	0.2					*(1-METHYLPROPYL)BENZENE*
119 3-(CHLOROMETHYL)HEPTANE	0.3					
120 1,2,3-TRIMETHYLBENZENE	0.4			125000	175000	HEMIMELLITENE
121 1ISOPROPYL4METHYLBENZENE	0.5					*METHYL(4-METHYLETHYL)BENZENE*; 3-ISOPROPYLTOLUENE; P-CYMENE
122 1,2-DICHLOROBENZENE	0.3					o-DICHLOROBENZENE
123 INDAN	0.5					*2,3-DIHYDRO-1H-INDENE*; 2,3-DIHYDROINDENE; HYDRINDENE
124 BUTYLCYCLOHEXANE	0.4					n-BUTYLCYCLOHEXANE; 1-CYCLOHEXYLBUTANE
125 1,3-DIETHYLBENZENE	0.4					m-DIETHYLBENZENE
126 1,4-DIETHYLBENZENE	0.5					p-DIETHYLBENZENE

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m³ (micrograms per cubic metre) Updated October 16, 1987

	Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
127 BUTYLBENZENE	0.3					n-BUTYLBENZENE
128 1,2-DIETHYLBENZENE	0.5					o-DIETHYLBENZENE
129 transDECAHYDRONAPHTHALENE	0.3					t-DECALIN; BICYCLO[4,4,0]DECANE
130 cis-DECAHYDRONAPHTHALENE	0.3					c-DECALIN; BICYCLO[4,4,0]DECANE
131 UNDECANE	0.8					*n-UNDECANE*; HENDECANE
132 1235-TETRAMETHYLBENZENE	0.6					ISODURENE
133 1234-TETRAMETHYLBENZENE	0.6					PREHNITENE
134 1,3-DIISOPROPYLBENZENE	0.8					*1,3-BIS(1-METHYLETHYL)BENZENE*
135 1234TETRAHYDRONAPHTHALENE	0.6					TETRALIN
136 1,4-DIISOPROPYLBENZENE	0.8					*1,4-BIS(1-METHYLETHYL)BENZENE*; ISOPROPYLCUMENE
137 NAPHTHALENE	0.8	36 (3)	22.5 (A)			
138 DODECANE	1.3					*n-DODECANE*

Table 2 ctd.

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #1

All concentrations are in terms of ug/m^3 (micrograms per cubic metre) Updated October 16, 1987

Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names

NOTES: (1) Standard
(2) Guideline
(3) Provisional Guideline
(4) Standard for the sum of o-, m-, & p- Xylenes

(A) Ambient Air Quality Criterion based on a 24-hour average concentration
(B) Ambient Air Quality Criterion based on a 1-hour average concentration
(please note; if the maximum 1-hour average concentration of a contaminant is LESS than the Criterion concentration based on a 24-hour average, then that Criterion has NOT been exceeded.)

TWA - Time Weighted Average for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed without adverse effect.

STEL - Short Term Exposure Limit - concentration to which workers can be exposed for a short period of time (15 minutes) without adverse effect.

* - Denotes name approved by the International Union of Pure and Applied Chemistry (IUPAC).

Table 2 ctd.

Characteristics of the Common Contaminants as Measured Continuously by MAMU #1

All concentrations are in terms of ppm (parts per million)

	Detection Limits	Standards, Guidelines or Provisional Guidelines		Criterion	TWA	STEL		Alternate Names	
1 SULPHUR DIOXIDE	0.005	0.300		0.25	2	5		SO2	SULFUR DIOXIDE
2 TOTAL REDUCED SULPHUR	0.005	0.027	*	0.027	10	15	**	TRS	
3 NITROGEN OXIDES	0.01	0.25	***	N/A	-	-		NOx	OXIDES of NITROGEN
4 NITROGEN DIOXIDE	0.01	N/A		0.20	5	5		NO2	
5 NITRIC OXIDE	0.01	N/A		N/A	25	35		NO	NITROGEN MONOXIDE
6 OZONE	0.01	0.1		0.08	0.1	0.3		O3	
7 CARBON MONOXIDE	0.1	5.0		30.0	50	400		CO	

* As equivalent H2S and applicable only for Kraft Pulp Mills
TRS may contain any of the following: Hydrogen Sulphide (H2S), Methyl Mercaptan (CH3SH), Dimethyl Sulphide (C2H6S) and Dimethyl Disulphide (C2H6S2).

** The TWA and STEL for TRS is expressed solely for Hydrogen Sulphide concentrations

*** Expressed as NO2

Table 3

Anachemia 1987 Air Quality Survey

Monitoring Periods and Site Information - MAMU#1

Monitoring Period*	Start Monitoring (hr/dd/mm)	Duration (hrs)	End Monitoring (hr/dd/mm)	Site** Location	# GC Runs	Comments
A212	11:03/21/07	3.6	14:39/21/07	Bell Canada	2	Upwind
A213	14:43/21/07	17.5	08:13/22/07	Bell Canada	-	Overnight
A222	10:07/22/07	2.8	12:55/22/07	Court.Disp.	2	Downwind
A223	14:18/22/07	1.0	15:19/22/07	Ultramar Ltd.	1	Upwind
A224	15:51/22/07	16.5	08:01/23/07	Bell Canada	-	Overnight
A232	09:52/23/07	1.0	10:53/23/07	Ultramar Ltd.	1	Upwind
A233	11:45/23/07	3.4	15:02/23/07	Court.Disp.	1	Downwind
A234	17:11/23/07	17.3	10:26/24/07	Bell Canada	-	Overnight
A282	10:02/28/07	3.6	13:35/28/07	Ultramar Ltd.	3	Downwind
A283	14:18/28/07	1.1	15:25/28/07	Lkside Contr.	1	Upwind
A284	15:50/28/07	16.3	08:08/29/07	Bell Canada	-	Overnight
A292	10:33/29/07	1.6	12:09/29/07	Court.Disp.	1	Upwind
A293	12:43/29/07	2.3	14:59/29/07	Ultramar Ltd.	2	Downwind
A294	15:25/29/07	17.2	08:35/30/07	Bell Canada	-	Overnight

* In the designation of Monitoring Periods: 'A' refers to Mobile Air Monitoring Unit #1 (MAMU#1); the next two digits, the day of the month; the final digit, the data acquisition episode of the day.

** See General Area Map on page 17.

Court.Disp. - Courtesy Disposal Limited
Lkside Contr. - Lakeside Contracting

Table #4

Common Contaminants - Anachemia '87 Air Quality Survey

Overall Average Ground Level Concentrations (ppm)

Monitoring Period	Start Time	Duration (hrs)	CO	THC	SO2	NO2	O3	Average[3] Wind
A212[4]	21/11:03	3.6	0.38	1.70	nd.	0.01	0.04	2812
A213	21/14:43	17.5	0.40	1.84	nd.[2]	0.02	0.02	****
A222	22/10:07	2.8	0.77	4.96	nd.	0.03	0.03	3111
A223	22/14:18	1.0	1.94	3.91	nd.	0.02	0.04	3115
A224	22/15:51	16.5	1.12	2.65	nd.	0.05	0.01	****
A232	23/09:52	1.0	1.33	3.22	nd.	0.05	0.04	2915
A233	23/11:45	3.4	1.30	4.91	nd.	0.03	0.07	2522
A234	23/17:11	17.3	0.85	1.86	nd.	0.02	0.05	****
A282	28/10:02	3.6	2.59	4.42	0.01	0.04	na.	1410
A283	28/14:18	1.1	0.82	2.85	nd.	0.03	na.	1217
A284	28/15:50	16.3	0.89	2.45	nd.	0.04	na.	****
A292	29/10:33	1.6	0.64	1.73	nd.	0.02	0.04	1311
A293	29/12:43	2.3	1.14	13.56	0.01	0.03	0.05	1113
A294	29/15:25	17.2	0.98	2.48	nd.	0.06	0.02	****

Maximum One-Hour Average Ground Level Concentrations (ppm)

Monitoring Period	CO	THC	NO2	O3	Wind at time of Maximum
A212	0.46	1.80	0.01	0.04	2816
A213	0.77	2.16	0.05	0.04	3421
A222	1.09	6.95	0.03	0.07	3515
A223	2.18	4.30	0.03	0.06	3216
A224	2.38	4.11	0.11	0.04	3513
A232	1.48	3.33	0.05	0.05	3017
A233	1.81	5.79	0.04	0.09	2625
A234	1.87	3.73	0.08	0.07	2923
A282	3.94	7.30	0.05	na.[1]	1515
A283	0.91	2.91	0.04	na.	1318
A284	2.40	3.13	0.06	na.	3516
A292	0.82	1.77	0.03	0.04	1413
A293	1.76	15.72	0.04	0.06	1213
A294	3.41	5.09	0.09	0.05	3505

1. na. - not available; instrument malfunction, insufficient time, etc.
2. nd. - not detected; concentration in ambient air less than detection limit of analyzer. The detection limit for the SO2 analyzer was 0.01 ppm.
3. Winds - the first two digits refer to the direction (in tens of degrees) from which the wind was blowing and the last two digits refer to the speed in km/hr.
4. Monitoring Period - The 'A' refers to Mobile Air Monitoring Unit #1; the next two digits, the day of the month; and the last digit, the monitoring episode of the day.

Table 5

Anachemia 1987 Air Quality Survey

(all concentrations in ug/m3)

	Monitoring Period	UPWIND A212	UPWIND A212	DOWNWIND A222	DOWNWIND A222	UPWIND A223	UPWIND A232	DOWNWIND A233	DOWNWIND A282	DOWNWIND A282	DOWNWIND A282	UPWIND A283	UPWIND A292	DOWNWIND A293	DOWNWIND A293
	Sample Duration	1 hr	1 hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr
	Date	JUL 21	JUL 21	JUL 22	JUL 22	JUL 22	JUL 23	JUL 23	JUL 28	JUL 28	JUL 28	JUL 28	JUL 29	JUL 29	JUL 29
	Sample Start Time	13:13	14:13	11:23	12:16	14:46	10:17	12:36	10:32	12:06	13:11	14:51	11:52	13:06	14:09
1	PROPANE	6.0	4.4	28.7	11.3	16.7	71.1	8.8	9.1	14.4	76.7	2.7	3.0	223.7	2.4
2	PROPADIENE														
3	PROPYNE														
4	CYCLOPROPANE														
5	2-METHYLPROPANE		3.0	6.6	8.3	3.2	6.2	5.5	5.0	3.7	15.7	1.0	1.7	3.9	
6	CHLOROETHENE														
7	1-BUTENE			2.6	2.1									3.5	2.4
8	1,3-BUTADIENE														
9	BUTANE	369.3	10.2	26.0	35.0	14.6	25.0	22.1	15.1	14.6	236.6	3.2	7.9	6.4	2.2
10	1-BUTYNE														
11	CHLOROETHANE														
12	3-METHYL-1-BUTENE														
13	2-METHYLBUTANE	12.3	8.6	19.7	24.4	11.8	18.9	17.7	8.7	9.5	19.0	2.3	3.1	4.8	8.6
14	2-METHYL-1-BUTENE			1.8	2.0									2.1	1.4
15	PENTANE	9.6	6.1	17.9	18.1	9.5	14.7	13.0	8.7	8.2	15.2	1.8	4.7	4.8	6.6
16	2-METHYL-1,3-BUTADIENE														
17	trans-2-PENTENE														
18	cis-2-PENTENE														
19	DICHLOROMETHANE			122.7	31.5			76.2	96.1	419.8	114.5			260.2	57.4
20	2-METHYL-2-BUTENE														
21	2,2-DIMETHYLBUTANE														
22	trans-1,2-DICHLOROETHENE														
23	3-METHYL-1-PENTENE														
24	4-METHYL-1-PENTENE														
25	CYCLOPENTANE														
26	2,3-DIMETHYLBUTANE													1.2	1.7
27	2-METHYLPENTANE	4.8	2.8	7.6	8.3	5.4	7.2	7.2	5.5	3.9	5.9			5.9	8.7
28	3-METHYLPENTANE	3.8	2.6	5.6	5.9	5.3	5.3	5.6	4.4	3.2	4.1			6.0	5.8

Table 5 ctd.

Anachemia 1987 Air Quality Survey

(all concentrations in ug/m3)

	Monitoring Period	UPWIND A212	UPWIND A212	DOWNWIND A222	DOWNWIND A222	UPWIND A223	UPWIND A232	DOWNWIND A233	DOWNWIND A282	DOWNWIND A282	DOWNWIND A282	UPWIND A283	UPWIND A292	DOWNWIND A293	DOWNWIND A293
	Sample Duration	1 hr	1 hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr
	Date	JUL 21	JUL 21	JUL 22	JUL 22	JUL 22	JUL 23	JUL 23	JUL 28	JUL 28	JUL 28	JUL 28	JUL 29	JUL 29	JUL 29
	Sample Start Time	13:13	14:13	11:23	12:16	14:46	10:17	12:36	10:32	12:06	13:11	14:51	11:52	13:06	14:09
29	1-HEXENE													1.2	1.2
30	cis-1,2-DICHLOROETHENE														
31	2-CHLOROBUTANE														
32	HEXANE	4.5	2.6	8.0	10.1	6.5	7.3	8.5	5.8	4.3	4.0			10.4	9.8
33	1-CHLORO-2-METHYLPROPANE														
34	TRICHLOROMETHANE														
35	trans-3-HEXENE														
36	3-CHLORO-2-METHYLPROPENE														
37	METHYLCYCLOPENTANE			2.1	2.3	1.4	2.2	1.9	1.4	1.5	1.2			3.8	5.0
38	2,2-DIMETHYLPENTANE														
39	1,2-DICHLOROETHANE														
40	2,4-DIMETHYLPENTANE														
41	1,1,1-TRICHLOROETHANE			7.0	3.5			7.1	40.4	63.8	39.0			21.6	2.2
42	2,2,3-TRIMETHYLBUTANE														
43	1-CHLOROBUTANE														
44	BENZENE	4.8	2.7	4.9		2.2	7.9	4.3	5.1	2.7	10.2	1.2		3.6	65.7
45	TETRACHLOROMETHANE														
46	3,3-DIMETHYLPENTANE														
47	CYCLOHEXANE													4.1	3.0
48	2,3-DIMETHYLPENTANE														
49	2-METHYLHEXANE	1.7	1.0	3.0		1.5	2.9	3.1		2.0	1.7			9.3	10.7
50	CYCLOHEXENE			2.0				1.3		4.4				13.2	4.9
51	DIBROMOMETHANE														
52	1,2-DICHLOROPROPANE														
53	3-METHYLHEXANE	1.2		2.1		1.0	1.8	2.4		1.6	1.2			9.0	9.4
54	2,3-DICHLOROPROPENE														
55	TRICHLOROETHENE														
56	2,2,4-TRIMETHYLPENTANE														

Table 5 ctd.

Anachemia 1987 Air Quality Survey

(all concentrations in ug/m3)

	Monitoring Period	UPWIND A212	UPWIND A212	DOWNWIND A222	DOWNWIND A222	UPWIND A223	UPWIND A232	DOWNWIND A233	DOWNWIND A282	DOWNWIND A282	DOWNWIND A282	UPWIND A283	UPWIND A292	DOWNWIND A293	DOWNWIND A293
	Sample Duration	1 hr	1 hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr
	Date	JUL 21	JUL 21	JUL 22	JUL 22	JUL 22	JUL 23	JUL 23	JUL 28	JUL 28	JUL 28	JUL 28	JUL 29	JUL 29	JUL 29
	Sample Start Time	13:13	14:13	11:23	12:16	14:46	10:17	12:36	10:32	12:06	13:11	14:51	11:52	13:06	14:09
57	1-HEPTENE														
58	HEPTANE	2.7	1.6	3.0			1.9	3.5		2.9	1.3			16.4	1.4
59	trans-2-HEPTENE														
60	METHYLCYCLOHEXANE														
61	2,2-DIMETHYLHEXANE														
62	ETHYLCYCLOPENTANE														
63	4-METHYLCYCLOHEXENE														
64	2,5-DIMETHYLHEXANE														
65	1-CHLOROPENTANE														
66	1,1,2-TRICHLOROETHANE														
67	2,3,4-TRIMETHYLPENTANE														
68	TOLUENE	14.6	13.0	164.9	80.0	40.8	21.6	86.9	90.5	239.6	66.3	3.5		854.5	582.8
69	1,3-DICHLOROPROPANE														
70	2-METHYLHEPTANE	3.0	2.2	2.2	1.7					4.4	2.2				
71	4-METHYLHEPTANE														
72	c-1,3-DIMETHYLCYCLOHEXANE	2.0	2.1	3.0					1.9	3.7	1.2				14.5
73	3-METHYLHEPTANE	2.2	3.0	3.4	3.2		1.5		2.3	4.3	1.2				
74	1,2-DIBROMOETHANE														
75	1,1-DIMETHYLCYCLOHEXANE														
76	1-OCTENE														
77	trans12DIMETHYLCYCLOHEXAN														
78	trans-4-OCTENE														
79	TETRACHLOROETHENE	3.6		34.6	13.0		9.3	2.0	23.3		11.0				
80	c-1,4-DIMETHYLCYCLOHEXANE														
81	OCTANE	6.4	4.5	5.2	1.6			2.6	1.6	3.0	1.1			6.2	15.1
82	trans-2-OCTENE														
83	cis12DIMETHYLCYCLOHEXANE														
84	CHLOROBENZENE														

Table 5 ctd.

Anachemia 1987 Air Quality Survey

(all concentrations in ug/m3)

	Monitoring Period	UPWIND A212	UPWIND A212	DOWNWIND A222	DOWNWIND A222	UPWIND A223	UPWIND A232	DOWNWIND A233	DOWNWIND A282	DOWNWIND A282	DOWNWIND A282	UPWIND A283	UPWIND A292	DOWNWIND A293	DOWNWIND A293
	Sample Duration	1 hr	1 hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr
	Date	JUL 21	JUL 21	JUL 22	JUL 22	JUL 22	JUL 23	JUL 23	JUL 28	JUL 28	JUL 28	JUL 28	JUL 29	JUL 29	JUL 29
	Sample Start Time	13:13	14:13	11:23	12:16	14:46	10:17	12:36	10:32	12:06	13:11	14:51	11:52	13:06	14:09
85	ETHYLCYCLOHEXANE														
86	1-CHLOROHEXANE														
87	ETHYLBENZENE	5.1	3.9	33.7	11.4		3.4		15.6	57.0	15.8			221.7	209.6
88	M,P-XYLENE	20.2	14.1	113.0	36.9		11.5	71.2	44.0	176.5	57.5	2.9		708.3	695.2
89	4-METHYLOCTANE													258.0	243.9
90	2-METHYLOCTANE													257.8	243.7
91	3-METHYLOCTANE	1.8	1.1												
92	STYRENE													4.0	3.8
93	1,4-DICHLOROBUTANE														
94	o-XYLENE	7.3	3.9		9.7		3.4		7.9		14.3			130.4	140.7
95	1,1,2,2-TETRACHLOROETHANE														
96	1,2,3-TRICHLOROPROPANE	2.1	1.1												3.6
97	1-NONENE													5.2	4.6
98	trans-1,4-DICL-2-BUTENE														
99	NONANE	4.8	2.4	1.9	2.5	3.6	1.1	3.4	1.9	4.0	1.6			14.4	13.5
100	ISOPROPYLBENZENE													2.9	3.2
101	2-CHLOROTOLUENE													3.1	4.3
102	3-CHLOROTOLUENE														
103	4-CHLOROTOLUENE	1.0					1.5	1.2							
104	PROPYLBENZENE	1.9		1.4				2.9	1.0	1.9	1.2				
105	3-ETHYLTOLUENE	1.7			2.2		2.1	4.0	3.5	5.7	4.8			7.5	8.1
106	4-ETHYLTOLUENE														
107	1,3,5-TRIMETHYLBENZENE														
108	2-ETHYLTOLUENE														
109	tert.BUTYLBENZENE														
110	1,2,4-TRIMETHYLBENZENE														
111	tert.BUTYLCYCLOHEXANE														
112	1,3-DICHLOROBENZENE														

Table 5 ctd.

Anachemia 1987 Air Quality Survey

(all concentrations in ug/m3)

	UPWIND	UPWIND	DOWNWIND	DOWNWIND	UPWIND	UPWIND	DOWNWIND	DOWNWIND	DOWNWIND	DOWNWIND	UPWIND	UPWIND	DOWNWIND	DOWNWIND
Monitoring Period	A212	A212	A222	A222	A223	A232	A233	A282	A282	A282	A283	A292	A293	A293
Sample Duration	1 hr	1 hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr
Date	JUL 21	JUL 21	JUL 22	JUL 22	JUL 22	JUL 23	JUL 23	JUL 28	JUL 28	JUL 28	JUL 28	JUL 29	JUL 29	JUL 29
Sample Start Time	13:13	14:13	11:23	12:16	14:46	10:17	12:36	10:32	12:06	13:11	14:51	11:52	13:06	14:09
113 (CHLOROMETHYL)BENZENE														
114 1-DECENE														
115 1,5-DICHLOROPENTANE			7.9	11.0										
116 isoBUTYLBENZENE													1.0	1.4
117 sec.BUTYLBENZENE														
118 DECANE	1.8		4.1	5.0	2.8	3.0	6.9	2.2	3.7	1.3				1.5
119 3-(CHLOROMETHYL)HEPTANE														
120 1,2,3-TRIMETHYLBENZENE														
121 1ISOPROPYL4METHYLBENZENE														
122 1,2-DICHLOROBENZENE														
123 INDAN														
124 BUTYLCYCLOHEXANE			2.7	2.7	2.2	1.7	1.1							1.4
125 1,3-DIETHYLBENZENE													5.6	7.7
126 1,4-DIETHYLBENZENE								1.7						
127 BUTYLBENZENE			1.2	1.8	1.2	1.1								
128 1,2-DIETHYLBENZENE			2.1	2.1	1.1	1.1								
129 transDECAHYDRONAPHTHALENE														
130 cis-DECAHYDRONAPHTHALENE														
131 UNDECANE	1.1	2.9	3.9	5.7	3.3	3.9	2.0	1.0					2.9	3.9
132 1235-TETRAMETHYLBENZENE			9.3	12.1	13.8	12.4	4.5							
133 1234-TETRAMETHYLBENZENE														
134 1,3-DIISOPROPYLBENZENE			1.8	2.2	1.5	3.4								
135 1234TETRAHYDRONAPHTHALENE														
136 1,4-DIISOPROPYLBENZENE														
137 NAPHTHALENE			15.6	29.1	22.1	20.2	17.4			1.9	1.8		1.6	1.6
138 DODECANE			9.8	17.3	13.0	13.5	8.3			1.8	1.7		1.2	1.1

Table 5 ctd.

Anachemia 1987 Air Quality Survey

(all concentrations in ug/m3)

Monitoring Period	UPWIND A212	UPWIND A212	DOWNWIND A222	DOWNWIND A222	UPWIND A223	UPWIND A232	DOWNWIND A233	DOWNWIND A282	DOWNWIND A282	DOWNWIND A282	UPWIND A283	UPWIND A292	DOWNWIND A293	DOWNWIND A293
Sample Duration	1 hr	1 hr	1/2-hr	1/2-hr	1/2-hr	1/2 hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr	1/2-hr
Date	JUL 21	JUL 21	JUL 22	JUL 22	JUL 22	JUL 23	JUL 23	JUL 28	JUL 28	JUL 28	JUL 28	JUL 29	JUL 29	JUL 29
Sample Start Time	13:13	14:13	11:23	12:16	14:46	10:17	12:36	10:32	12:06	13:11	14:51	11:52	13:06	14:09
Total Compounds Identified	55	44	59	39	29	52	43	42	51	49	15	6	52	47
Total Organic Conc. (ug/m3)	501.1	99.3	692.9	413.9	184.4	287.7	402.2	403.7	1064.1	729.3	22.1	20.4	3101.2	2415.6
Alkanes (ug/m3)	436.9	58.7	158.8	158.4	98.1	185.2	120.3	71.4	87.7	390.5	12.6	20.4	842.1	589.9
Cycloalkanes (ug/m3)	2.0	2.1	7.7	5.0	3.6	3.9	3.0	3.3	5.2	2.4	0.0	0.0	7.9	23.8
Alkenes (ug/m3)	0.0	0.0	4.4	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	9.6
Cycloalkenes (ug/m3)	0.0	0.0	2.0	0.0	0.0	0.0	1.3	0.0	4.4	0.0	0.0	0.0	13.2	4.9
Alkynes (ug/m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aromatics (ug/m3)	55.5	37.5	347.9	187.5	82.6	87.9	191.1	169.3	483.3	171.9	9.4	0.0	1941.1	1719.8
Chlorinated Alkanes (ug/m3)	2.1	1.1	137.5	46.0	0.0	0.0	83.3	136.4	483.5	153.5	0.0	0.0	281.8	63.2
Chlorinated Alkenes (ug/m3)	3.6	0.0	34.6	13.0	0.0	9.3	2.0	23.3	0.0	11.0	0.0	0.0	0.0	0.0
Chlorinated Aromatics (ug/m	1.0	0.0	0.0	0.0	0.0	1.5	1.2	0.0	0.0	0.0	0.0	0.0	3.1	4.3